

PURWANCHAL UNIVERSITY	
I SEMESTER BACK-PAPER EXAMINATION-2001	
LEVEL : B. E. (Civil)	
SUBJECT: BEG156CI, Applied Mechanics-I(Statics)	
	Full Marks: 80
TIME: 03:00 hrs	Pass marks: 32

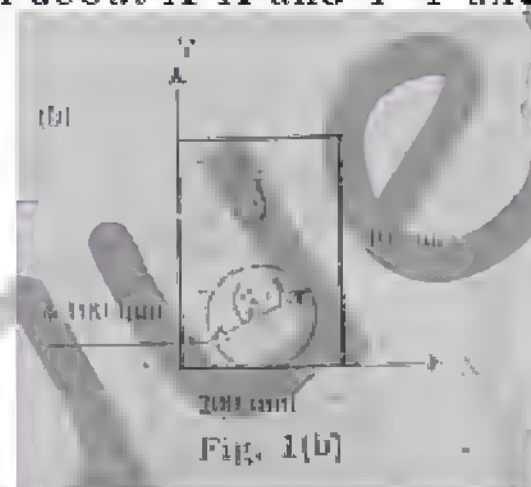
Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt any FIVE questions selecting minimum of TWO from each GROUP.

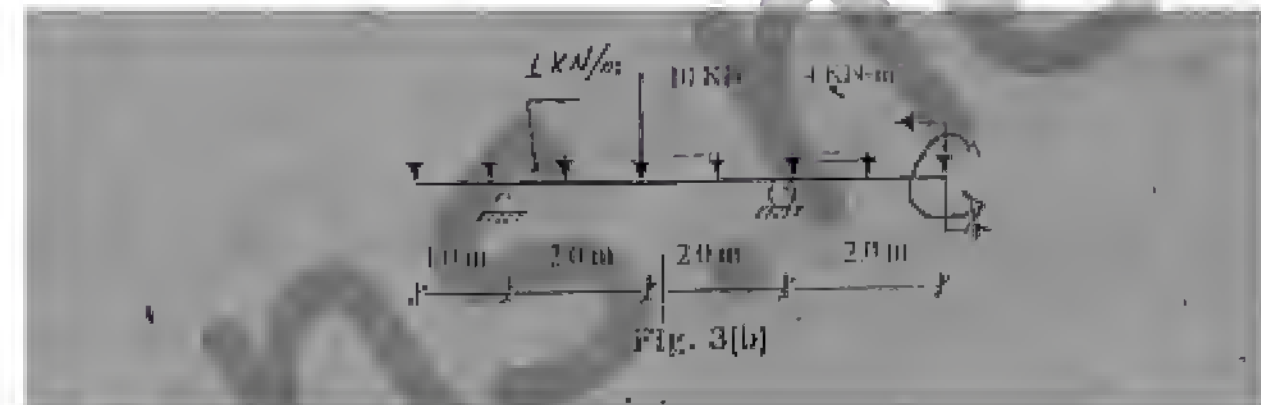
GROUP-A

- Q. [1] [a] Explain static equilibrium in 3-D System. Also explain the types of support. [3+3]
 [b] Given a rectangular section with a circular body inside it as shown in fig. 1(b). Calculate the moment of Inertia of the section about X-X and Y-Y axes. [10]

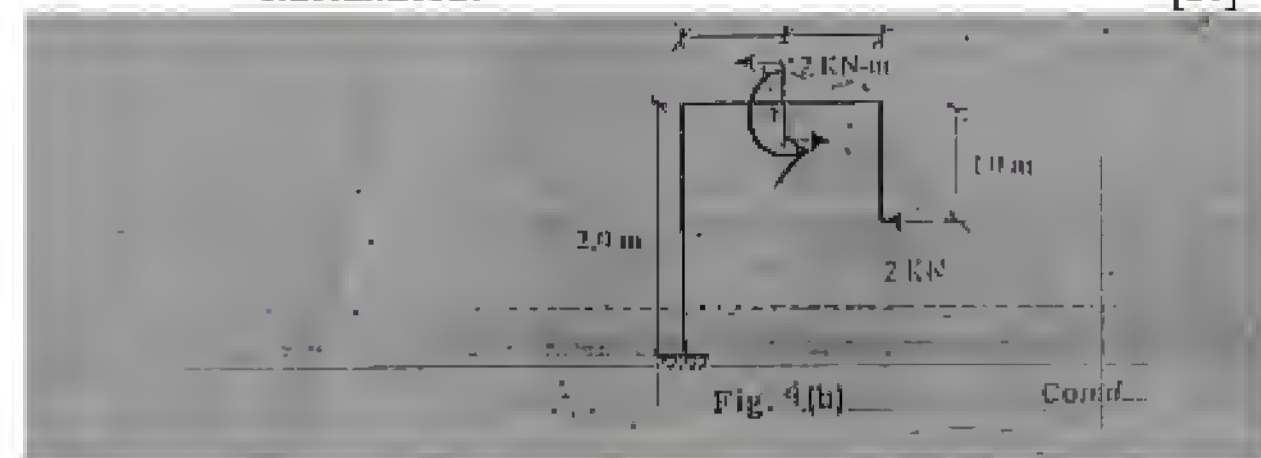


- Q. [2] [a] Explain the method of joint and method of section in the analysis of a truss. [6]
 [b] A force $F = 10i + 6j$ N goes through the origin of the coordinate system. What is the moment of this force F about an axis going through points 1 and 2 with position vectors $r_1 = 6i + 3k$ m; $r_2 = 16j - 4k$ m? [10]

- Q. [3] [a] Explain the concept of Free Body Diagram with sketch. [4]
 [b] Draw Bending Moment and Force Diagrams of a beam as shown in Fig. 3(b). Also the calculations. [12]



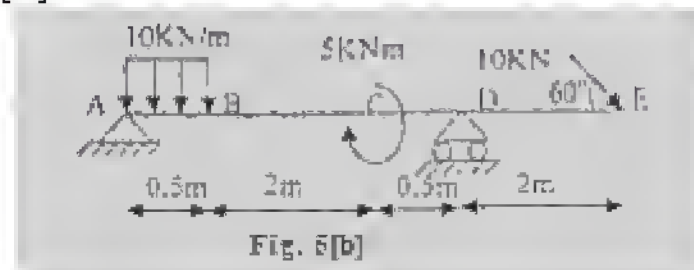
- Q. [4] [a] Explain the difference between the beam and truss elements. Also explain the concept of statically determinate and indeterminate structures.
 [b] Draw the Bending Moment and Shear Force Diagrams of the frame, as shown in Fig. 1(b) with calculations. [10]



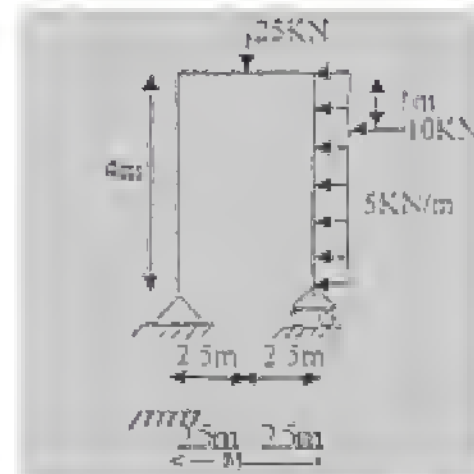
GROUP-B

- Q. [5] [a] explain the concept of resolution of forces into force and couple and vice versa. [4]
 [b] Given a truss element as shown in Fig. 5[b]. Calculate the forces in elements 1-2, 2-4, 4-5 and 6-7. [12]

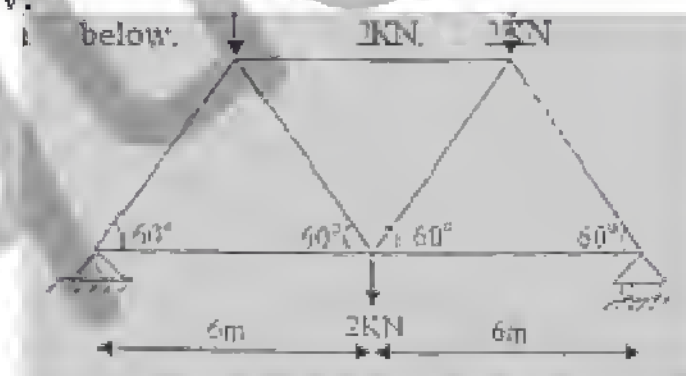
- [b] Draw axial force, shear force and bending moment diagrams for the beam as shown in Fig. 5[b].



- Q. [6] [a] Draw axial force, shear force and bending moment diagrams for the frame given below.



- Q. [7] [a] Define space truss. Discuss on the determinacy and stability of space truss.
- [b] Determine the force in all the members of the given below.



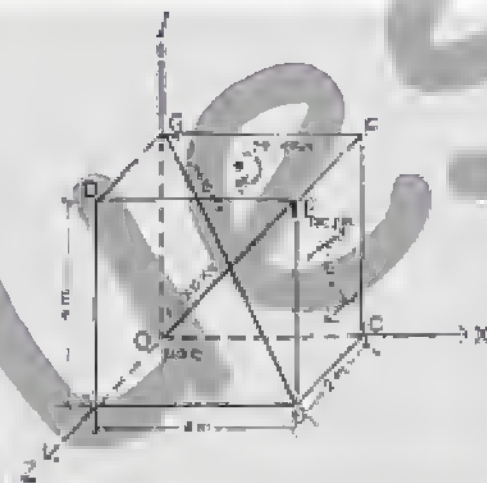
PURWANCHAL UNIVERSITY
I SEMESTER FINAL EXAMINATION-2008
LEVEL : B. E. (Civil)
SUBJECT: BEG156CI, Applied Mechanics-I(Statics)
Full Marks: 80
Pass marks: 32
TIME: 03:00 hrs

Candidates are required to give their answers in their own words as far as practicable.

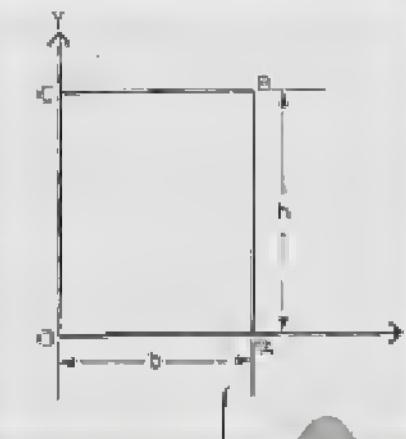
The figures in the margin indicate full marks. The marks allotted for each sub-question is specified along its side.

Attempt any FIVE questions.

- Q. [1] [a] What do you mean by equilibrium condition of rigid body? Differentiate between scalar and vector quantities. [6]
 [b] Find the resultant force and the resultant moment about point O. [10]



- Q. [2] [a] Determine the centroid of area of a rectangle of breadth b and height h . [6]



- [b] Calculate the moment of inertia about X-X and Y-Y axes. [10]

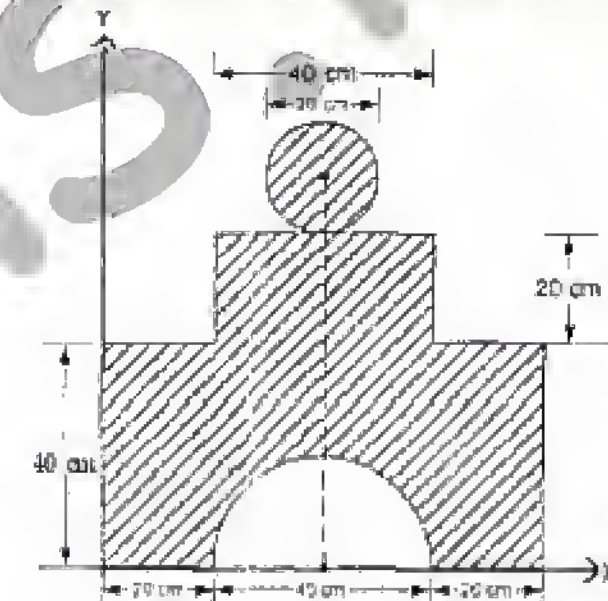


Fig. 2(b)

- Q. [3] [a] Explain the principle of transmissibility of force. [6]
 [b] Two smooth spheres 'P' and 'Q' each of radius 25 cm and weighing 500 N, rest in a horizontal channel having vertical walls as shown in Fig. 3(b). If the distance between the walls is 90 cm, make calculations for the pressure exerted on the wall and floor at points of contact A, B, and C. [10]

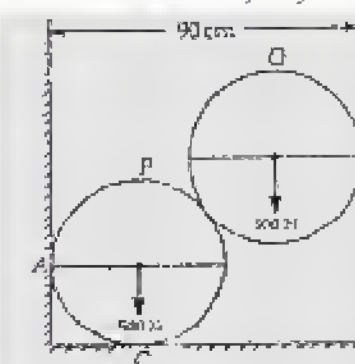


Fig. 3(b)

- Q. [4] [a] What is the main cause for friction? What do you understand by static and kinetic friction?[3+3]
- [b] A bulkhead 4m long divides a storage tank. On one side, there is petrol of specific gravity 0.78 stored a depth of 2m while other side, there is an oil of specific gravity 0.88 stored to a depth of 0.9 m. Determine the resultant pressure on bulkhead and the position at which it acts. [10]

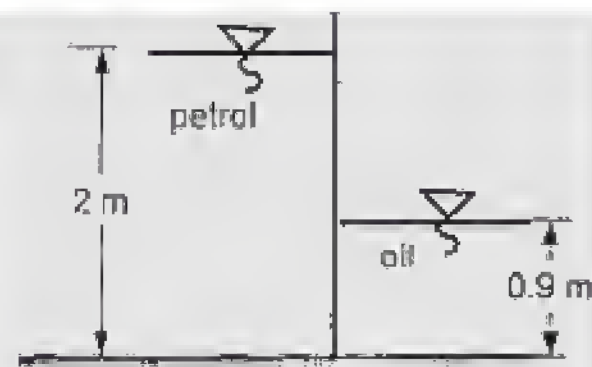


Fig. 4(b)

- Q. [5] [a] Define space truss. Write down the analysis steps for a space truss. [6]
- [b] For the beam shown in figure, draw share force diagram, bending moment diagram. [10]

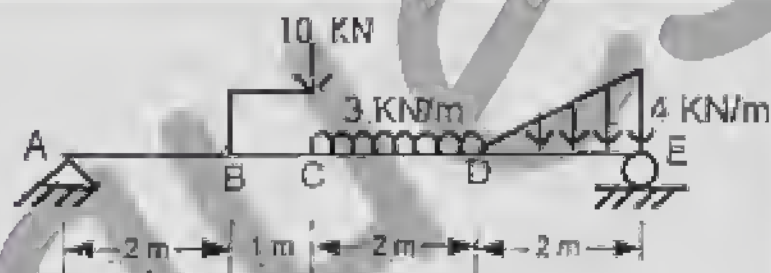


Fig. 5(b)

- Q. [6] [a] Define shear force and bending moment with the sign conventions. [6]
- [b] A truss has been loaded and supported as shown in Fig. 6(b). Make the calculation for the reactions at the supports and the forces in the members of the truss. [8]

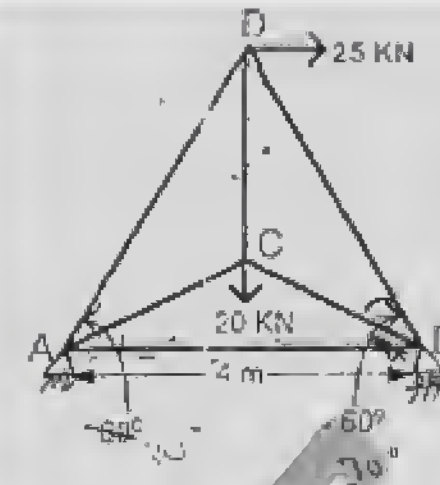


Fig. 6(b)

- Q. [7] Draw axial force, shear force and bending moment diagrams for the figure given below. [16]

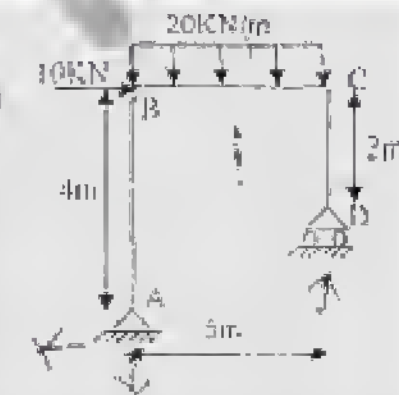


Fig. 7

PURWANCHAL UNIVERSITY
I SEMESTER CHANCE EXAMINATION-2009
LEVEL : B. E. (Civil)
SUBJECT: BEG156CI, Applied Mechanics-I(Statics)

Full Marks: 80
Pass marks: 32

TIME: 03:00 hrs

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

- Q. [1] [a] Illustrate equilibrium condition of a rigid body and concept of free body diagram. [6]
- [b] Two homogeneous spherical ball rests between two vertical walls as shown in Fig. 1(b). The radius of smaller ball is 20 cm and weight 2.5 kN. The radius of larger ball is 26 cm and weight is 4 kN. The distance between the wall is 80 cm. Assuming the contact surface to be smooth, determine the reactions at A, B, and C. [10]

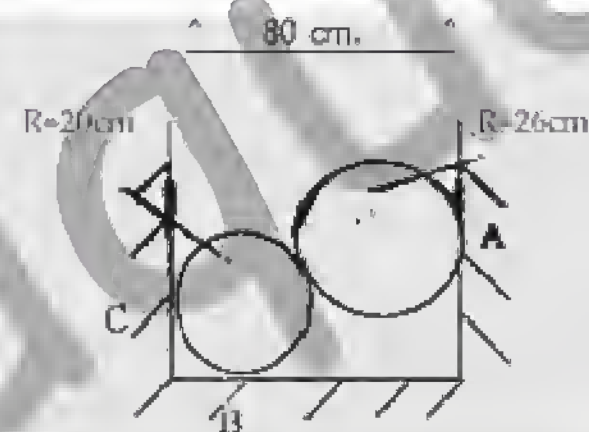


Fig. 1(b)

- Q. [2] [a] If two forces at same magnitude 35kN acts at points A and B as shown in figure 2(a) and force at A passes through C and force at B passes

through D. Find: (i) equivalent force couple system at 'O', (ii) equivalent wrench and give the pitch and axis of wrench. [10]

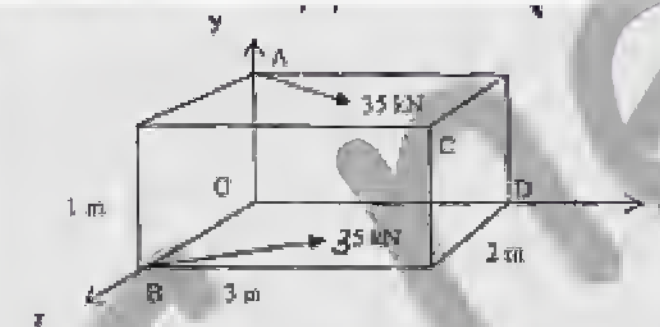
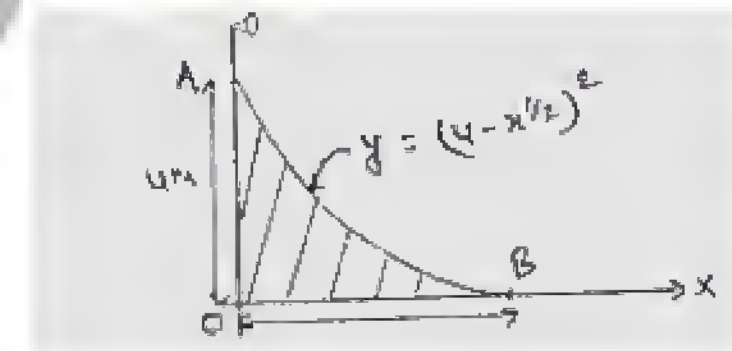


Fig. 2(a)

- [b] Define a couple and illustrate their characteristics. [2+4]

- Q. [3] [a] Locate the centroid of the area under the curve as shown in Fig- 3(a) (using the method of integration). [8]



- [b] Determine the moment of inertia of a I-section about the centroid axis parallel to the flange: - [8]

Top flange = 100mm x 10mm

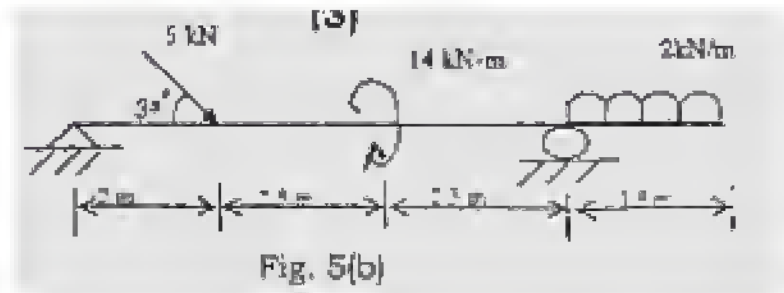
Bottom flange = 200mm x 10mm

Web = 100mm x 10mm

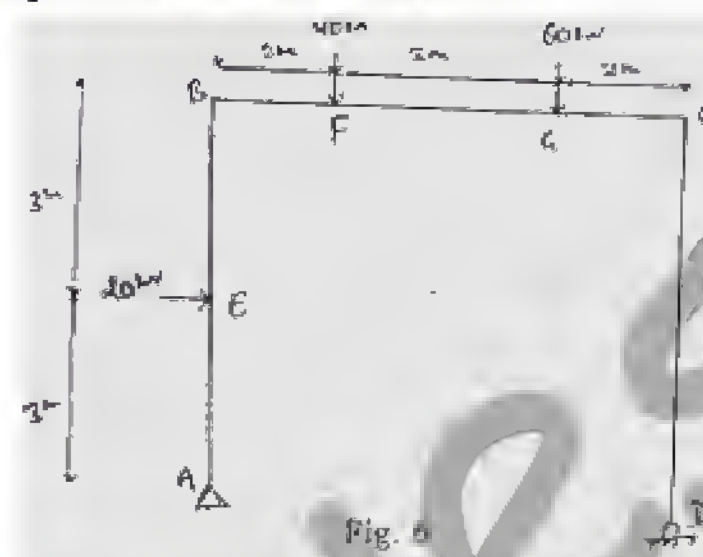
- Q. [4] [a] Define the following terms: [2+2+2+2]
- (i) limiting friction (ii) angle of friction
- (iii) co-efficient of friction (iv) angle of repose
- [b] What do you mean by centre of pressure? Show that the centre of pressure lies below the centre of gravity of the immersed object. [2+6]

Q [5] [a] Describe about the types of loading and supports with figures. [6]

[b] Draw shear force and bending moment diagram for the loaded beam shown in Fig. 5(b). Also show the calculations. [10]

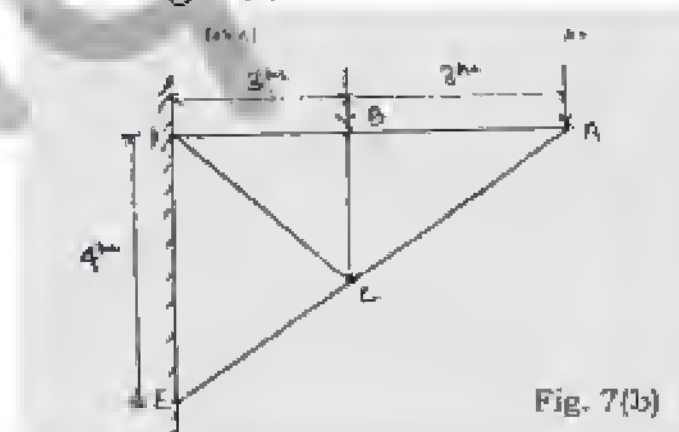


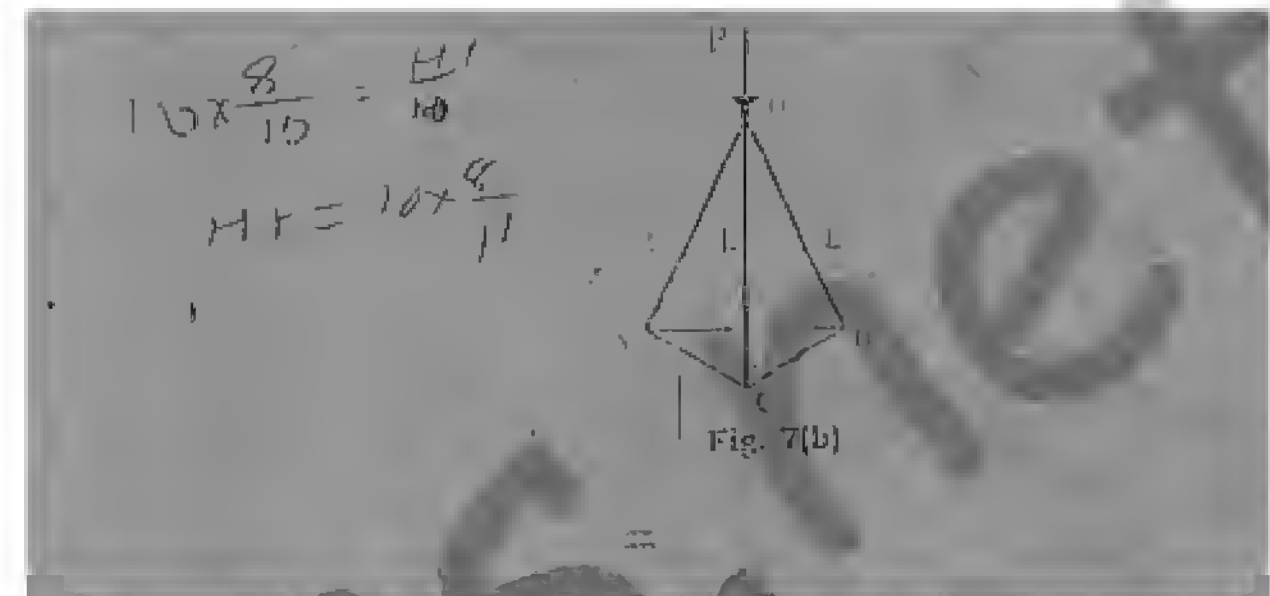
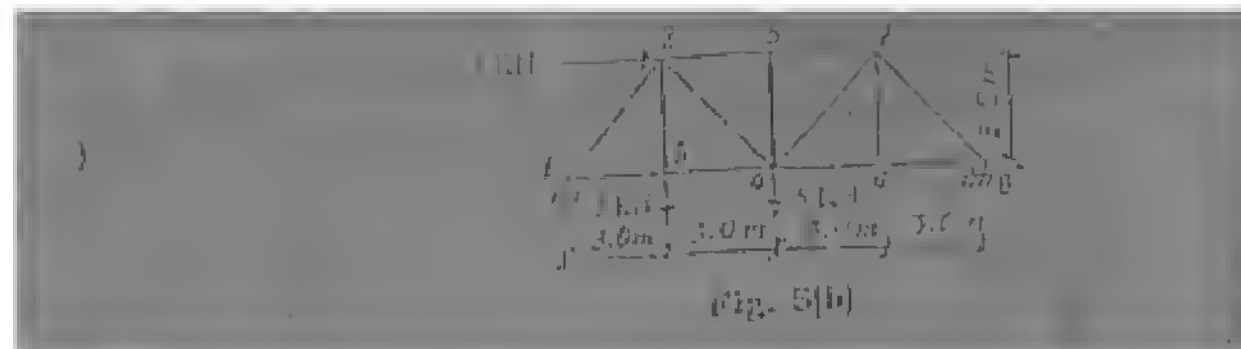
Q. [6] Draw axial force, shear force and bending moment diagram for the frame below: [16]



Q. [7] [a] What do you mean by tension coefficient? How can it be obtained? [2+4]

[b] Find the member forces in the given truss as shown in Fig. 7(b). [10]





- Q. [6] [a] Explain the concept of intensity of pressure andpressure on a vertical surface. (G) (b) Bodies A and U weigh 500 N and 300 N, respectively. The platform on which they are placed is raised from the horizontal position to an angle θ . What is the maximum angle that can be reached before the bodies slip down the incline? Take μ for body B and the plane as 0.2 and for body A and the plane as 0.3. [10]

- Q. [7] [a] Prove couple moment as a free vector. [b] In the case of a tripod shown, there is no friction between the ends of the legs and the floor on which they rest. To prevent slipping of the legs, their ends are connected by strings along the lines AB, BC, and AC. Determine, then, the tensile force in each of the strings if each leg makes 30° angle with the vertical axis. The vertical load $P=10\text{KN}$: [Refer Fig. 7(b).] [12]

PURWANCHAL UNIVERSITY	
I SEMESTER FINAL EXAMINATION-2003	
LEVEL : B. E. (Civil)	
SUBJECT: BEG156CI, Applied Mechanics-I(Statics)	
TIME: 03:00 hrs	Full Marks: 80
	Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt any FIVE questions, choosing at least TWO questions from each GROUP.

GROUP-A

Q. [1] [a] Explain static equilibrium in 3-D System.

Also explain the types of support. [3+3]

[b] Given a rectangular section with a circular body inside it as shown in fig. 1(b). Calculate the moment of Inertia of the section about X-X and Y-Y axes. [10]

Q. [1] [a] Define particle and rigid body. Explain the equilibrium on ... of a rigid body. [2+4]

[b] Find the reactions on the smooth surfaces of container due to smooth roller A and B of radius 20 cm and 30 cm and weights 50 kg and 70 kg respectively. [10]

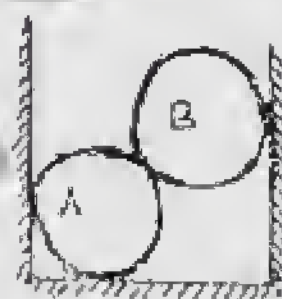


Fig. 1(b)

Q. [2] [a] Define the couple and prove it as free vector. [2+4]

[b] The 6 m boom AB has a fixed end A. A steel cable is stretched from the free end B of the boom to a fixed point C located on the vertical wall. If the tension in the cable is 1900N, determine the moment about A of the force exerted by the cable at B. [10]

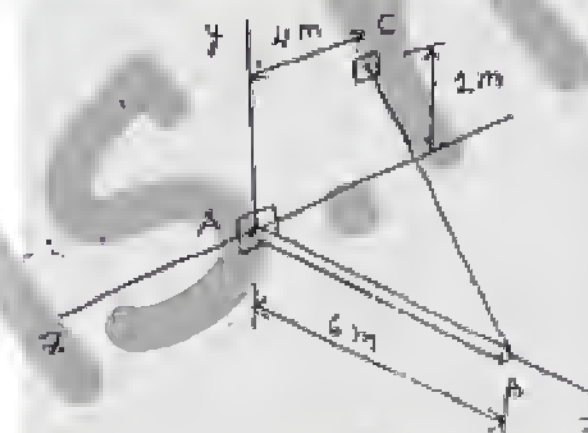


Fig. 2(b)

Q. [3] [a] State and prove parallel axis theorem as applied to moment of inertia. [6]

[b] Find the centroid of the composite Fig. 3(b). [10]

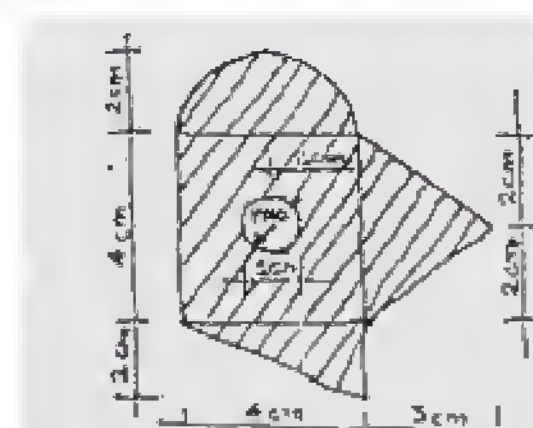
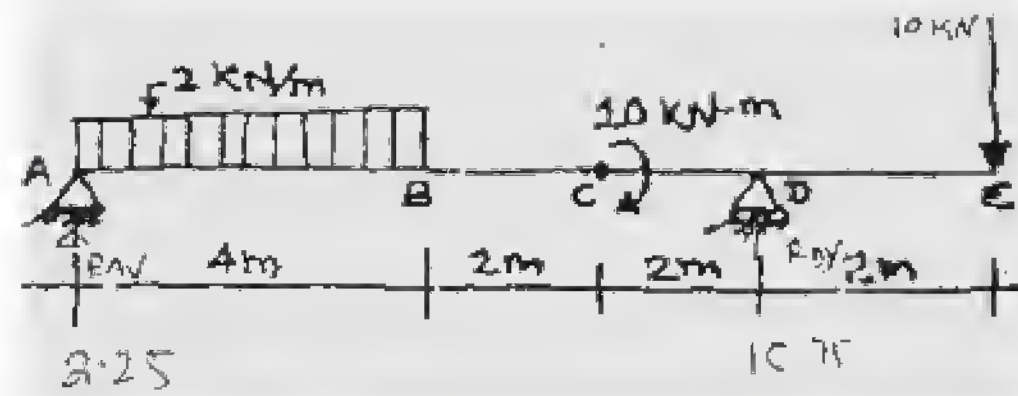


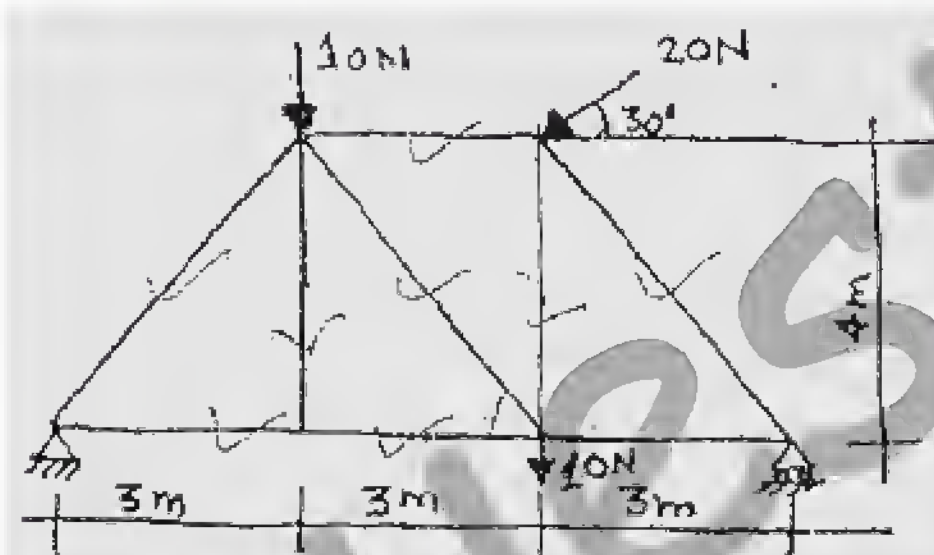
Fig. 3(b)

Q. [4] [a] Define friction force, co-efficient of friction and angle of friction. [6]

[b] Draw shear force and bending moment diagram of the beam loaded as shown in Fig. 4(b) [10]



- Q. [5] [a] Illustrate briefly about the types of load and support that may occur in any structure. [6]
 [b] A truss is loaded as shown in Fig.5[b]. Find out the member forces developed in all the members. [10]



- Q. [6] Draw axial force, shear force and bending moment diagram for a frame loaded as shown in Fig.[6]. [16]

Figure:

PURWANCHAL UNIVERSITY	
I SEMESTER FINAL EXAMINATION-2004	
LEVEL : B. E. (Civil)	
SUBJECT: BEG156CI, Applied Mechanics-I (Statics)	
TIME: 03:00 hrs	Full Marks: 80 Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks. The marks allotted for each sub-question is specified along its side.

Attempt any FIVE questions.

- Q. [1] [a] State and prove Lami's theorem. [6]
 [b] Two cylinders A and B rest in an incline surface which makes an angle of 30° with the horizontal axis as shown in Fig 1[b]. Determine the reactions at the contact points assuming all surface of contact as smooth. [10]

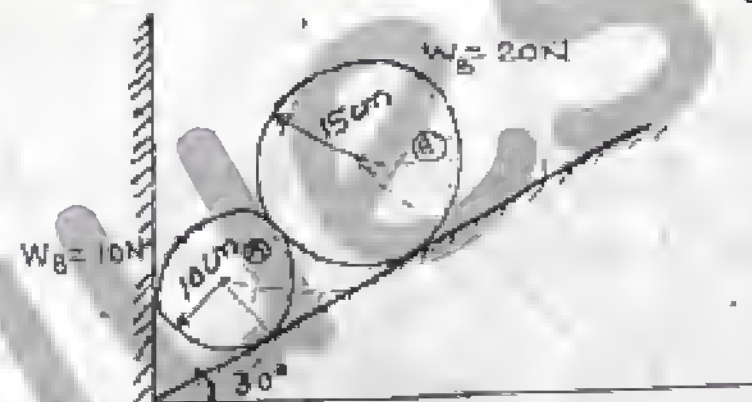
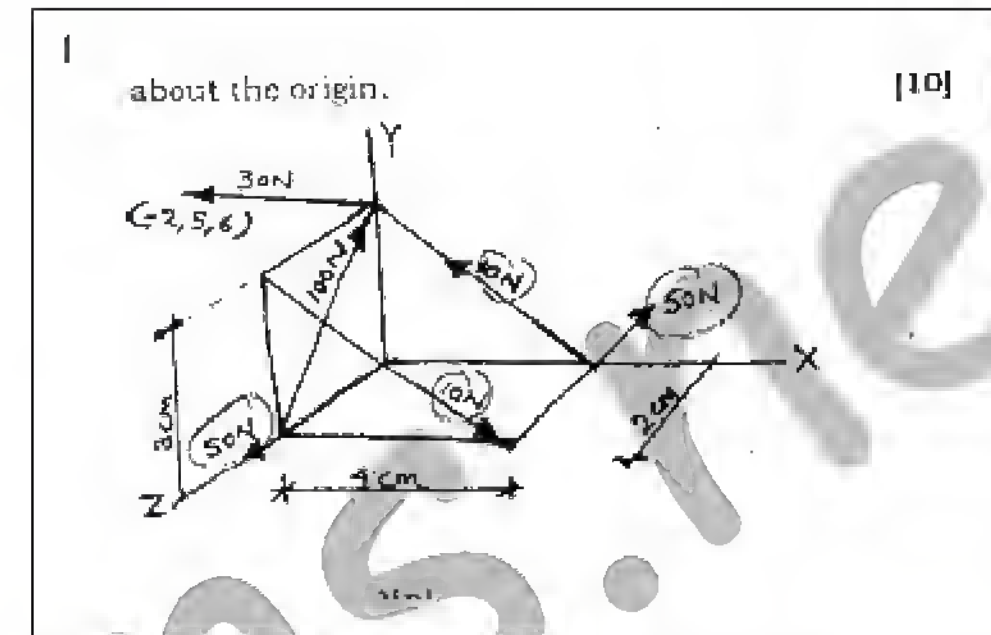


Fig. 1[b]

- Q. [2] [a] Define vector quantities. Also define the cross products between any two vectors. [6]
 [b] Find the resultant of the system of given forces about the origin. [10]



- Q. [3] [a] State and prove parallel axis theorem used in moment of inertia. [6]
 [b] Determine the centroid of the shaded area shown in Fig. 3(b) by direct integration method. [10]

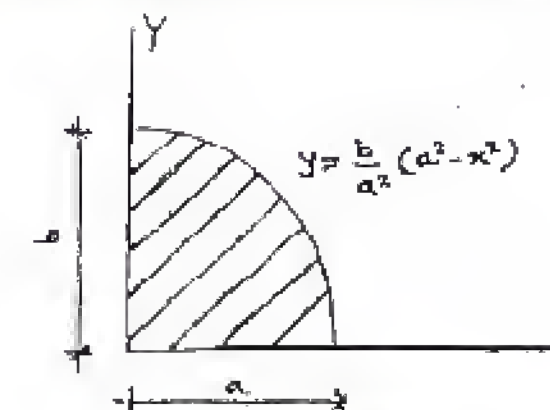


Fig. 3[b]

- Q. [4] [a] Define friction between any two surfaces of contact. List out the laws of static friction. [6]
 [b] A circular plate 3.2 m diameter is submerged in water with its greatest and least depths below the surface being 2.2m and 1m respectively. Find the total pressure on one face of the plate and the position of the centre of pressure.

- Q. [5] [a] Define the axial force, shear force and bending moment that is developed in any section of a beam due external loadings. [6]
 [b] Draw shear force and bending moment diagram for the beam loaded as shown in Fig. 5[b]. [10]

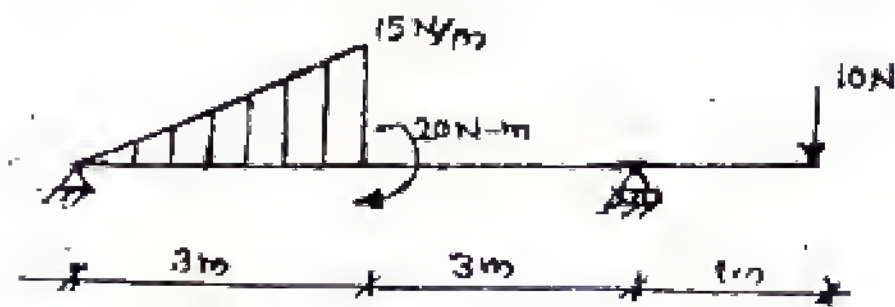


Fig. 5[b]

- Q. [6] Draw axial force, shear force and bending moment diagram for a frame loaded as shown in Fig. [6]. [16]

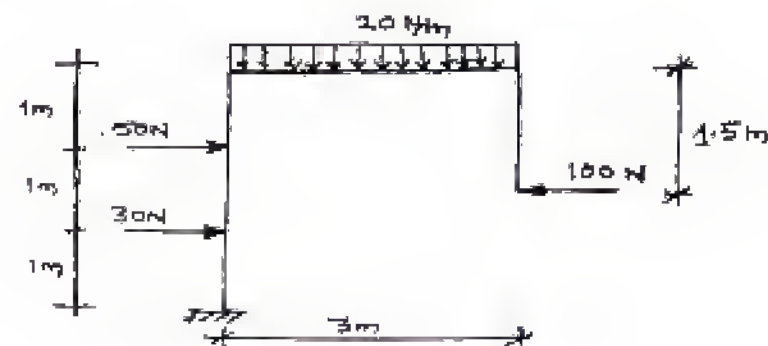
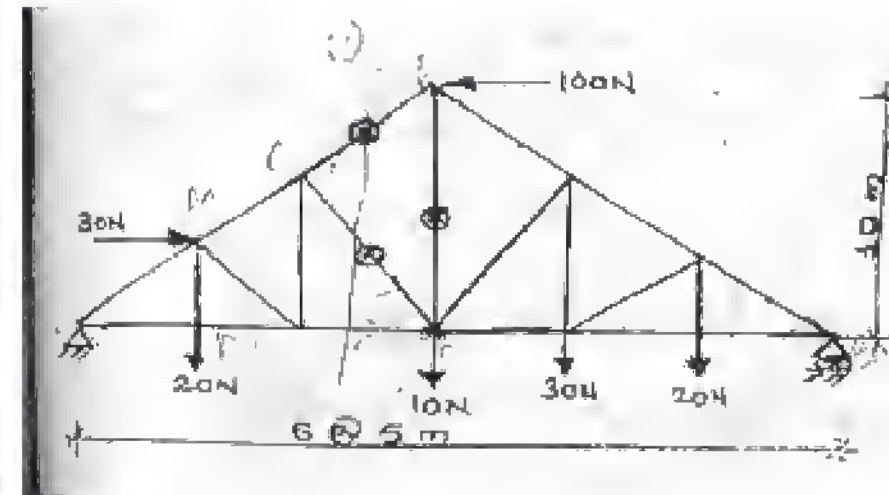


Fig. 6[b]

- Q. [7] [a] Define space truss. Discuss the different methods of solving the space truss loaded with point loads at different joints. [6]
 [b] Determine the forces in the indicated members of a truss loaded with the forces as shown in Fig. 7[b]. [10]



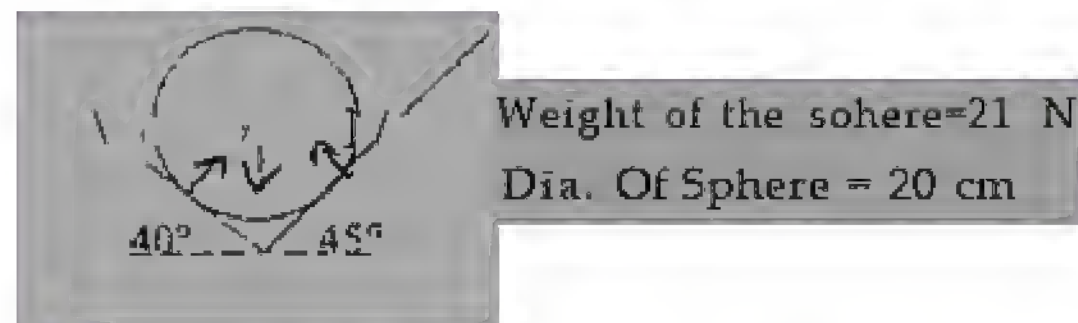
PURWANCHAL UNIVERSITY	
I SEMESTER BACK-PAPER EXAMINATION-2005	
LEVEL : B. E. (Civil)	
SUBJECT: BEG156CI, Applied Mechanics-I (Statics)	
	Full Marks: 80
TIME: 03:00 hrs	Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

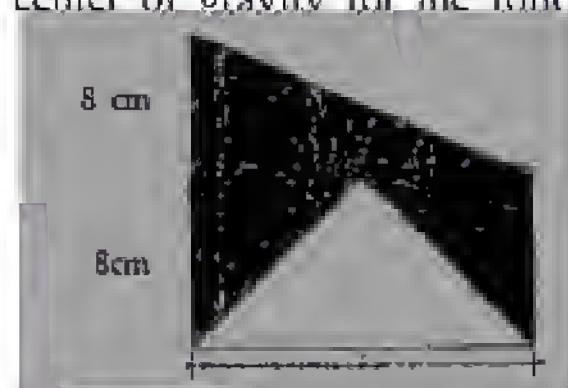
The figures in the margin indicate full marks. The marks allotted for each sub-question is specified along its side.

Attempt any FIVE questions.

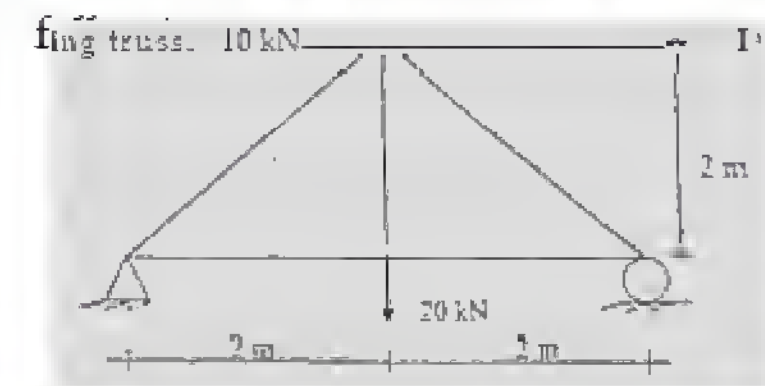
- Q. [1] [a] What do you mean by position vector and moment of a force about a point? How do you obtain moment of a force about an axis? [6]
- [b] For the following figure, find the reactions at contact surfaces.



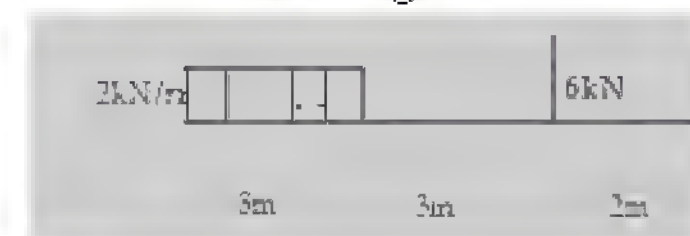
- Q. [2] [a] What is radius of gyration and moment of inertia? State and explain perpendicular axis theorem. [6]
- [b] Find the center of gravity for the following shaded Figure. [10]



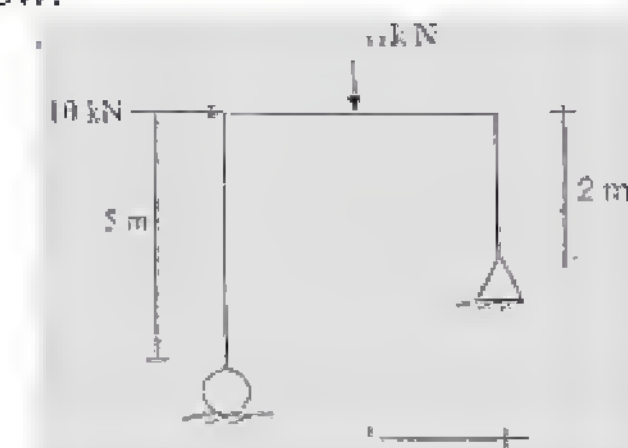
- Q. [3] [a] Define a truss. Differentiate between determinate and indeterminate truss structures. [6]
- [b] Find the member forces in each member of the following truss. [10]



- Q. [4] [a] What is a beam? What are the different types of load that might act upon the beam? Explain. [6]
- [b] Draw shear force and bending moment diagram for the following beam. [10]



- Q. [5] Draw Axial force diagram, shear force diagram and bending moment diagram for the frame structure given below.



- Q. [6] [a] Define friction and differentiate between static and dynamic friction.
- [b] A body resting on a rough horizontal plane required a pull of 180 N inclined at 30 degree to the .. just to move it. It was found that a push of: inclined at 30 degree to the plane just move body. Determine the weight of the body coefficient of friction.
- Q. [7] [a] Define hydrostatic pressure, pressure diagram center of pressure.
- [b] A bulkhead 3m long divides a storage tank. ...side, there is petrol of specific gravity 0.78 store a depth of 1.8m, while on the other side there oil of specific gravity 0.85 to a depth off. Determine the resultant pressure on the bulk and the position at which it acts. I

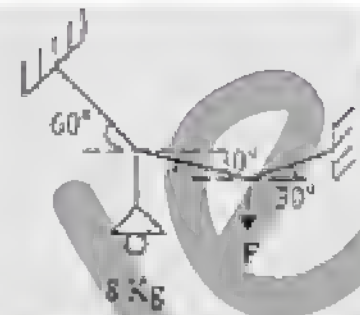
PURWANCHAL UNIVERSITY	
I SEMESTER FINAL EXAMINATION-2007	
LEVEL : B. E. (Civil)	
SUBJECT: BEG156CI, Applied Mechanics-I (Statics)	
TIME: 03:00 hrs	Full Marks: 80 Pass marks: 32

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks. The marks allotted for each sub-question is specified along its side.

Attempt any FIVE questions.

- Q. [1] [a] What do you understand by principle of equilibrium of rigid body. [6]
 [b] Determine the force in each cable and the force F needed to hold the 8 Kg lamp in the position shown in figure below. [10]



- Q. [2] [a] State the principle of transmissibility of forces. What are its limitations? [4+2]
 [b] Find moment about CD. Note that the 400Nm couple moment is along the diagonal from point A to point B as shown in Fig.2[b]. [10]

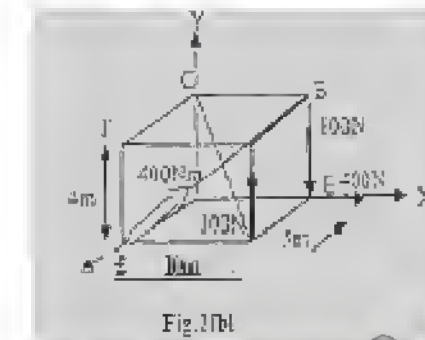
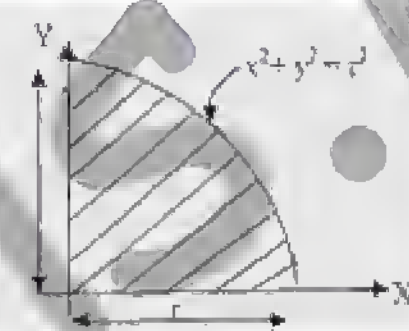


Fig.1(b)

- Q. [3] [a] Locate the centroid of the quarter circle. [8]



- [b] What should be the distance between the two identical channel sections shown in Fig.3[b] kept back to back, such that $I_{xx} = I_{yy}$ where xx and yy are centroidal axes. [8]

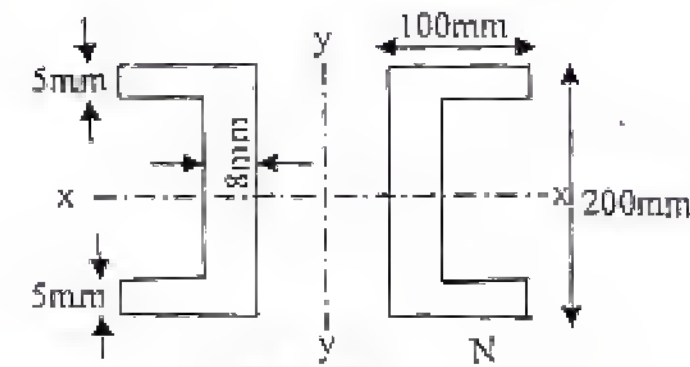


Fig. 3[b]

- Q. [4] [a] What are the effects of friction. Explain the condition of tipping of a block before it slides. [3+5]
 [b] Prove that the centre of pressure of a surface immersed in liquid lies below its center of gravity. [8]
 Q. [5] [a] Define structure. Describe briefly some support beam.